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Mīkhāʾīl Mishāqā: Virtual Founder of the Twenty-four Equal Quartertone Scale

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When Mikhāʾīl Mishāqā (1800–1888)[1] traveled to Damascus in 1820 to receive instruction from the renowned scholar Sheikh Muḥammad al-ʿAttār,[2] the Ottoman empire was ruling over Lebanon and Syria and had Istanbul as its principal cultural center. Seated at the gate of Europe, Istanbul began during the first half of the eighteenth century to differentiate itself culturally from neighboring provinces, especially Arabic and Persian, by sustaining an attraction towards European models.[3] This led to a reform in 1839 which introduced a European-inspired jurisdiction.[4] Likewise in music, the nomination of Guiseppe Donizetti as conductor of the imperial orchestra in 1826 came to confirm European influence on Turkish music.[5]

Besides, Ṣafi 'l-Dīn al-Urmawī's scale with no quartertones was integrated in Turkish music during the end of the eighteenth century. This helped to distinguish Turkish music from Arabic music, insofar as the former became solely based on natural intervals while the latter included quartertones.[6] In other words, the Turkish musical scale made a definitive shift from a system with neutral (2.5 comma) tones to a broader system featuring single comma tones.[7] Subsequently, additional scale degrees led to the gradual expansion of the scale beyond its seventeen intervals as originally formulated by Ṣafi 'l-Dīn al-Urmawī in the thirteenth century.

The consolidation of a distinctly Ottoman scale and repertory in the court music of Istanbul probably created or reinforced differences between it and other practices in the regions,[8] particularly Arab musical practice. Musicians may have been attracted to Istanbul and adopted the Turkish scale (which excluded quartertones), but others, such as Sheikh

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[1] Mishāqā was a self-taught medical doctor from Lebanon, knowledgeable in mathematics, music, politics, literature, and religious studies.

[2] Born and raised in Lebanon, Mīkhāʾīl Mishāqā settled in Damascus in 1846. Biographical references recount Mishāqā as controversial. He was appointed vice-consul of the United States in Damascus in 1859. See Amnon Shiloah, *The Theory of Music in Arabic Writings (c. 900–1900): Descriptive Catalogue of Manuscripts in Libraries of Europe and the U.S.A.* (Munich: G. Henle Verlag, 1979), 278; Girgī Zaydān, *Tārīkh ādāb al-lugha al-ʿarabiyya*, vol. 2 (Beirut: Dār Maktabat al-Ḥayāt, 1967), 633.

[3] Kurt and Ursula Reinhard, *Turquie* (Buchet/Chastel: Les traditions musicales, 1969), 38.

[4] Ibid., 47.

[5] Ibid., 43.

[6] Jean During, *Quelque chose se passe: Le sens de la tradition dans l'Orient musical* (Paris: Verdier, 1994), 149.

[7] Walter Zev Feldman, "Ottoman Music," in *The New Grove's Dictionary of Music and Musicians*, 2nd ed., vol. 18, 811. Al-Urmawī's scale is based upon two units of intervals: the interval 243/256 (90.23 cents) and the interval 524288/531441 (23.46 cents) known as the Pythagorean comma. Organized sequences of these intervals produce larger natural intervals. For example, two times the interval 243/256 (90.23 cents) produces approximately the interval 9/10 (182.4 cents), whereas the sequence of two times the interval 243/256 (90.23 cents) followed by the interval 524288/531441 (23.46 cents) produces the whole-tone 8/9 (203.91 cents), and recurs five times throughout the scale. See Shireen Maalouf, *History of Arabic Music Theory: Change and Continuity in the Tone Systems, Genres, and Scales* (Kaslik-Lebanon: Université Saint-Esprit de Kaslik, 2002), 153.

[8] Owen Wright, "Arab Music," in *The New Grove's Dictionary of Music and Musicians*, 2nd ed., vol. 1, 810.

Muhammad al-ᶜAttār (1764–1828) sought a theoretical scale in Arabic music that included quartertones.

Very little is known about al-ᶜAttār's life and work. But in his *Essay on the Art of Music for the Emir Shihāb (al-Risāla al-shihābiyya fī 'l-ṣināᶜ a al-mūsīqiyya),*[9] dedicated to the division of the octave into twenty-four equal quartertones, Mishāqā reports that he was present when his teacher al-ᶜAttār discussed that topic on several occasions.[10]

However, a misreading of the *Essay on the Art of Music*, found in an extensive literature on the theory of Arabic music, led to the commonly-spread belief that Mishāqā was the founder of the twenty-four equal quartertone scale. The translation of the essay in Arabic, French, and English seems not to have helped reduce the recurrence of this misreading. Instead, it seems to have encouraged it in different languages, as is observed in the following quotations selected from the period after the 1880s.

J. P. N. Land wrote: "With Mishāqā, we witness something, so far unencountered, which is analogous to our system of equal semi-tones. The whole octave is divided into twenty-four intervals called quartertones."[11]

Rodolphe d'Erlanger commented: "The fundamental idea of the system promoted by this reformer [Mishāqā] consists of attributing a uniform value to all of the twenty-four intervals in the octave."[12]

Habib Hassan Touma noted that "not until the nineteenth century . . . did an original theoretical work on music that reinvigorated the field of Arabian music theory once again appear. In this work, the Lebanese author Mīkhāʾīl Mishāqā (1800–1889) presented the division of the octave into twenty-four equal parts."[13]

Owen Wright in *The New Grove Dictionary* says: "At the beginning of the 19th century the Lebanese theorist Mīkhāʾīl Mishāqā, in his *Risāla al-shihābiyya fī al-ṣināʾa al-mūsīqiyya* ('Treatise on the art of music for the Emir Shihab'), introduced a new system for analyzing scale, which is now accepted in much of the Near East. In this system an octave is divided into 24 intervals of approximately a quarter-tone (each about 50 cents)."[14]

The reason for this false ascription to Mishāqā may be that the discussions on the division of the octave into twenty-four equal quartertones as held in circles of scholars in Lebanon and Syria gave the impression of a general disorder in need of remedy, as is seen in the following quote:

> Around 1830, a musician from Damascus, Michel Meshaqa endeavored to resolve the disorder in art. . . . By adopting the principle of temperament, Meshaqa divides the octave into twenty-four equal quartertones. . . .[15]

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[9] Mishāqā's essay was translated into English by Eli Smith in 1849 and into French by Louis Ronzevalle in 1913. The Arabic original text was only published in 1899. Mīkhāʾīl Mishāqā, "al-Risāla al-shihābiyya fī 'l-ṣināᶜa al-mūsīqiyya," tr. Eli Smith under the title "A Treatise on Arab Music, Chiefly From a Work by Michail Meschakah of Damascus," *Journal of the American Oriental Society* 1 (1849): 171–217. Idem, "al-Risāla al-shihābiyya fī 'l-ṣināᶜa al-mūsīqiyya," ed. and tr. Louis Ronzevalle under the title "Un traité de musique arabe moderne," *Mélanges de la faculté orientale de l'université Saint-Joseph de Beyrouth* 6 (1913): 1–120. Idem, *al-Risāla al-shihābiyya fī 'l-ṣināᶜa al-mūsīqiyya*, intro. Louis Ronzevalle (Beirut: Maṭbaᶜat al-Ābāʾ al-Yasūᶜiyyīn, 1899).

[10] The Arabic word Sheikh (lit. old man) and the Turkish word Efendī (lit. master) are used for a man of property, authority, or education.

[11] J. P. N. Land, "Recherches sur l'histoire de la gamme arabe," in *Actes du sixième congrès international des orientalistes tenu en 1883 à Leide* (Leiden, 1883), 75.

[12] Rodolphe d'Erlanger, *La musique arabe*, vol. 5 (Paris: Paul Geuthner, 1949), 32.

[13] Habib Hassan Touma, *The Music of the Arabs*, tr. Laurie Schwartz (Portland: Amadeus Press, 1996), 19.

[14] Owen Wright, "Arab Music," in *The New Grove's Dictionary of Music and Musicians*, 1st ed., vol. 1, 521.

[15] J. Dom Parisot, *Musique orientale: Conférence prononcée dans la salle de la sociéte Saint-Jean le 28 février 1898* (Paris: Schola Cantorum, 1898), 15.

> Meshaqa's tentative is defective in its principle since he arbitrarily deforms the intervals by bringing them by means of temperament to an evenly proportional length. . . . At the present hour, the essay on music by the Damascene scholar is the practical manual of musicians in Syria.[16]

Nonetheless, all the above-mentioned quotations contradict Mishāqā's own epilogue to the *Essay on the Art of Music*. There Mishāqā says:

> In 1236 hegira [1820], I arrived in Damascus leaving my home in Deir al-Qamar because of problems in my country. I took the opportunity to study some of the arts with my teacher Sheikh Muḥammad al-ᶜAttār . . . and I witnessed numerous debates between him and ᶜAbd Allāh Afandī Mahradār on the subject described below. . . . Sheikh al-ᶜAttār's conception was to tie a string, or something similar, on an instrument, like the *ṭunbūr* for example. When plucked, the open string produces the note *Yakāh*. When the string is plucked again, with a finger pressing on a fret placed at half the distance of the string, the produced note will be *Nawā*, which is the upper octave of *Yakāh*. Then the distance between the open string and this fret is divided into twenty-four equal parts. . . . In this way one ascends, fret by fret, and the striking of the string on each fret produces one quarter of the twenty-four quarters. . . . This is what the aforementioned Sheikh [al-ᶜAttār] believed to be true, but this is careless on his part, as the examination of this conception will show. . . .[17]

This epilogue clearly reveals that the twenty-four equal quartertone scale was already known before Mishāqā. Although one might deduce that such a scale was established by al-ᶜAttār,[18] modern studies have demonstrated that this equal division, defended by al-ᶜAttār, had already spread in musical circles of the time.[19] In fact, the earliest known mention of a twenty-four equal quartertone scale goes back to the late eighteenth century,[20] although some studies have attempted to demonstrate its use as early as the twelfth century.[21]

In the above-quoted epilogue, Mishāqā reports that he observed a mathematical error in the way al-ᶜAttār divided the string into twenty-four equal string lengths to obtain the twenty-four equal quartertones of the octave (see figure 1). Mishāqā contested this method and hence wrote his essay for two purposes: first, to propose a mathematically correct division of the string apt to produce twenty-four equal quartertones (this could be a major reason as to why Mishāqā came to be thought founder of the twenty-four equal quartertone scale); and second, to verify whether the twenty-four equal quartertone scale reflected the practice of Arabic music.

Furthermore, Mishāqā reports that he consulted many writings on the art of music which mention that the octave is divided into twenty-four quartertones, without determining the values of these intervals. Plus, he did not find "any of the Arabs attempting to support their view, or to explain how the matter [the division into quartertones] stands; which indeed could be successfully attempted only by the most thorough masters who have a competent knowledge in mathematics."[22] Thus, Mishāqā proposes mathematical techniques to calculate the accurate string lengths of the twenty-four equal quartertones.

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16. Ibid., 17.

17. Mishāqā, "al-Risāla al-shihābiyya," ed. Ronzevalle, 105–6.

18. Shiloah, *Theory of Music in Arabic Writings*, 64.

19. Scott Marcus, "Arab Music Theory in the Modern Period" (Ph.D. diss., Univ. of California, Los Angeles, 1989), 70.

20. Jean Benjamin Laborde, *Essai sur la musique ancienne et moderne*, vol. 1 (Paris: Imprimerie de Ph.D. Pierres, 1780), 436–39; Marcus, "Arabic Music Theory in the Modern Period," 13, 68, 162–63.

21. Henry George Farmer, "Histoire abrégée de la gamme arabe," in *Recueil des travaux du congrès de musique arabe qui s'est tenu au Caire en 1932*, ed. Ministère de l'instruction publique (Cairo: Imprimerie nationale, 1934), 653.

22. Mishāqā, "al-Risāla al-shihābiyya," tr. Eli Smith, 216. Mishāqā, "al-Risāla shihābiyya," ed. Ronzevalle, 109.

The basic idea of these mathematical techniques is that the length of an interval on a string is directly proportional to the length of the string. By placing the finger on the half of a string, one obtains the octave. By placing the finger on the quarter of the string, one obtains the octave of the octave, simply because the quarter is the half of the half, and so on.

Figure 2 reproduces Mishāqā's geometrical illustration in which the bases of the triangles contained in the first half of the string (i.e., the first octave) are equal in size. Likewise the bases of the triangles contained in the third quarter of the string (i.e., the second octave) are also equal in size. The bases of the triangles do not indicate string lengths. If they did, figure 2 would not be any different from figure 1.

Mishāqā clarifies that the string length of a quartertone is indicated by the mediatrice of its corresponding triangle. For example, the string length of the quartertone between the note *ʿIrāq* and the note *Kawāsht* is indicated by the mediatrice of triangle number 8. As can be observed in figure 2, the mediatrices diminish in a geometrical progression, and hence so do the string lengths of the quartertones.

This geometrical illustration provides the correct string lengths for each of the twenty-four quartertones and is an important tool that Mishāqā will use to verify whether the twenty-four equal quartertone scale corresponds to the practice of Arabic music in a yet to come live experiment.

Very early in his essay, Mishāqā presents the following hypothesis:

> The Arabs acknowledge two kinds of intervals, one big and one small. The big one is worth four-quarters and the small one is worth three-quarters. The four-quarter interval separates the notes *Yakāh* to *ʿUshayrān*, *Rāst* to *Dūkāh*, and *Jahārkāh* to *Nawā*. The three-quarter interval separates *ʿUshayrān* to *ʿIrāq*, *ʿIrāq* to *Rāst*, *Dūkāh* to *Sīkāh*, and *Sīkāh* to *Jahārkāh*. . . . The total number of quarters within the octave is twenty-four.
>
> The modern Greeks refer to the notes *Dūkāh* as 'Pā' and *Māhūr* as 'Nī': 'Pā' is the first note of the octave and 'Nī' is the last one. They acknowledge three kinds of intervals. The first interval is equal to the four-quarter interval of the Arabs, but they [the modern Greeks] divide it into twelve minutes. The second interval contains nine minutes and separates *Dūkāh* to *Sīkāh* and *Ḥusaynī* to *Awj*. The third interval is equal to seven minutes and separates *Sīkāh* to *Jahārkāh* and *Awj* to *Māhūr*. The total number of minutes within an octave is sixty-eight.[23]

This hypothesis proposes two procedures for dividing the octave. The first, suggested by the Arabs, divides the octave into twenty-four equal quartertones, and the second one, suggested by the "modern Greeks," divides the octave into sixty-eight minutes. The first procedure acknowledges two kinds of intervals, and the second procedure three.

Clearly, Mishāqā did not invent either of these two procedures; they already existed. A comparison of the two (see figure 3) according to Mishāqā's description shows that they converge on five stable notes: G, A, C, D, and F. Two mobile notes, E- and B-, slightly differ from one procedure to another. However, since Mishāqā does not elaborate more on the "modern Greek" procedure, the reader is left unable to extract with accuracy the intervals to B- and E-.

It is certain that the "modern Greek" intervals are not Pythagorean because, if they were, the five stable notes would differ in the two procedures. Mishāqā probably uses the terms "modern Greek" as a synonym for "Byzantine." In fact, in Byzantine music and up to this day, "Pā" is the first note of the octave and "Nī" is the last one.

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[23] Mishāqā, "al-Risāla al-shihābiyya," ed. Ronzevalle, 73. *Yakāh* (G); *ʿUshayrān* (A); *ʿIrāq* (B–, i.e., below B but above B flat); *Rāst* (C); *Dūkāh* (D); *Sīkāh* (E–, i.e., below E but above E flat); *Jahārkāh* (F); *Nawā* (G); *Ḥusaynī* (A); *Awj* (B–); *Māhūr* (C).

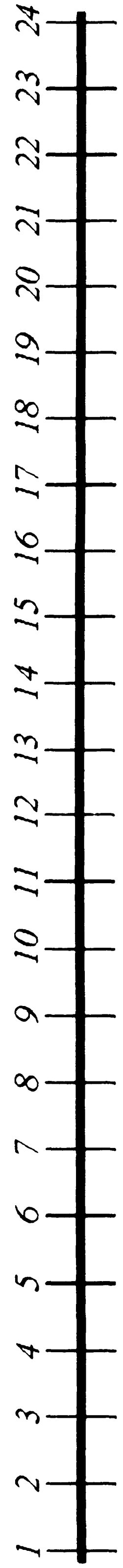

FIG. 1. Partitioning the string into twenty-four equal parts.

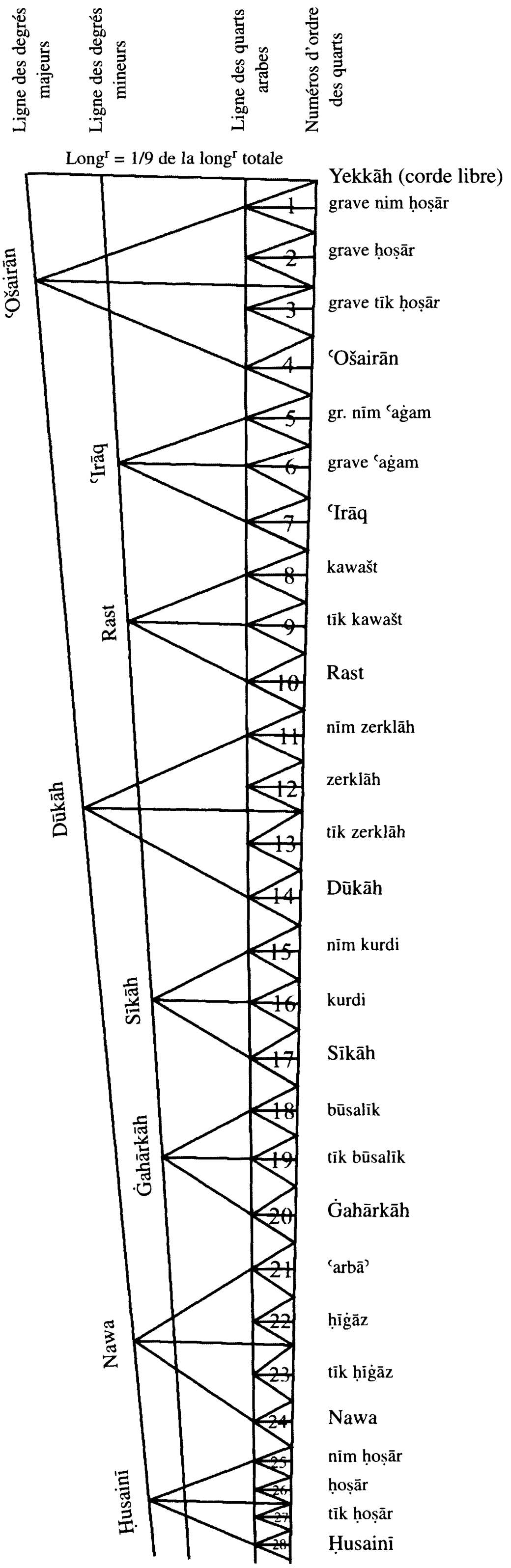

FIG. 2. Partitioning the string into twenty-four quartertones.

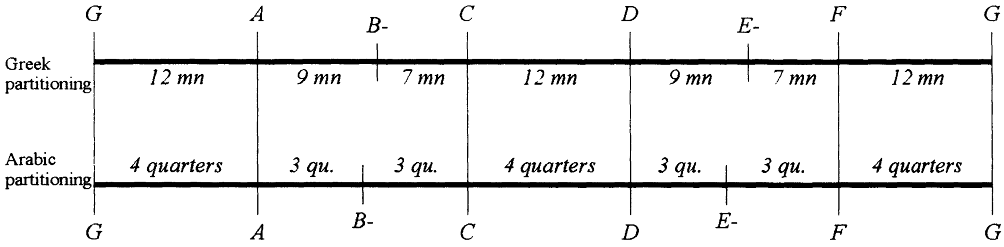

FIG. 3. Two procedures for partitioning the octave.

Mishāqā aimed to find out which of the two procedures for dividing the octave generates the two mobile notes as they existed in the practice of Arabic music. For this, he took two *tunbūr*.[24] He sectioned the strings of the first instrument into twenty-four equal quartertones as shown in figure 2 and the strings of the second instrument into sixty-eight minutes, according to the modern Greek procedure. The live experiment consisted of performing contemporary familiar tunes successively on the two instruments.

As shown in figure 3, the two procedures for dividing the octave converge on the five stable notes G, A, C, D, and F, whereas the two mobile notes, E- and B-, slightly differ from one procedure to another. When Mishāqā performed familiar tunes on each of the *ṭunbūr*, he was able to ascertain which of the two methods for dividing the octave was in agreement with the practice of Arabic music.

Mishāqā reports that, during the live experiment, the same tune sounded properly on the *ṭunbūr* with the strings sectioned into sixty-eight minutes, but did not sound properly on the *ṭunbūr* with the strings sectioned into twenty-four equal quartertones. Thus, "the error is in the division into quartertones by the Arabs, while the Greeks are right in their division. . . ."[25] Mishāqā concludes in a few last sentences to his forty-three page essay.

Hence, in the *Essay on the Art of Music for the Emir Shihāb* Mishāqā verified that, while the Arabs divided the octave into twenty-four equal quartertones in theory, Arabic music did not correspond to a twenty-four equal quartertone scale in practice. In other words, the Arabs *believed* that the music they performed corresponded to a scale of twenty-four equal quartertones, but the music they performed did not embody any *fixed* quartertones.

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[24] A long-necked, stringed, fretted instrument used to accompany chanting and singing.

[25] Mishāqā, "al-Risāla al-shihābiyya," tr. Eli Smith, 216. Mishāqā, "al-Risāla al-shihābiyya," ed. Ronzevalle, 113.